DOCUMENT RESUME

ED 080 209 PS 006 767

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TITLE Developmental and Social Influences from Birth on School Readiness in a Metropolitan Cohort.
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SPONS AGENCY National Coordination Center for Early Childhood Education, St. Ann, Mo.; National Inst. of Education (DHEW), Washington, D.C.
PUB DATE Feb 73
NOTE 14p.; Paper presented at the Annual Meeting of the American Educational Research Association (New Orleans, Louisiana, February 26 - March 1, 1973)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Infants; *Longitudinal Studies; Mothers; Parent Influence; *Preschool Children; Preschool Tests; Racial Differences; *Readiness; School Readiness Tests; Social Differences; *Social Influences
IDENTIFIERS Illinois Test of Psycholinguistic Abilities; Peabody Picture Vocabulary Test; Preschool Attainment Record; Wechsler Intelligence Scale for Children

ABSTRACT

This paper reports on a longitudinal study of significant influences on the cognitive readiness of a group of children, aged 60 to 66 months. All measures were obtained by prospective study, which began with Apgar scores calculated in the delivery room. Subsequent measures were gathered by individual case studies in homes, with children and examiners matched by race. Tests used were the Preschool Attainment Record, the Peabody Picture Vocabulary Test, the Illinois Test of Psycholinguistic Abilities, and the Wechsler Intelligence Scale for Children. Results of data analysis suggest that readiness considered as cognitive maturity has two contradictory aspects: (1) it is demonstrably influenced by identifiable elements in the preschool years, (2) the degree of influence exerted by identified influences is less than that exerted by unidentified influences. To some extent, all three predictor domains: child, maternal, and environmental data, have a role in shaping readiness. Social class appears to have the greatest influence. (ST)

DEVELOPMENTAL AND SOCIAL INFLUENCES FROM BIRTH ON SCHOOL READINESS IN A METROPOLITAN COHORT[1,2]

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INTRODUCTION

We live at a time when prevalent concepts of the sixties touching on the preschool years have come under serious scrutiny. The ideas of that turbulent decade on early development had two conceptual poles. One was occupied by social scientists, the other by educational practitioners. The first set seem, in retrospect, to have been largely inexperienced ideologues, some child clinicians, others theoretical developmentalists. The second set emerge in retrospect as, generically, kindly ladies fixated in the Romantic tradition of education. Both sets of hard-working folk believed in good works and in justification by faith. In some respects no other point of view was possible; a data-based approach to the potentialities of early childhood was scarcely feasible and, even when glimpsed, seemed impractical and unnecessary.

This report emerges from a program of studies begun in the late fifties in order to explore influences on elementary school performance. It has incorporated the potential value of biological data in interaction with social circumstances in the preschool years. The data of this report on influences on school readiness come from the St. Louis Baby Study. In particular, the data are from the second of three cohorts, a group of

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[1]This study was supported by the National Program on Early Childhood Education (CEMREL) and by the National Institute of Education.

[2]A paper presented to the American Educational Research Association, New Orleans, La., 1973.

1008 newborns delivered in the winter of 1966-67, and now at age 72 months. We have generated about 350 pieces of data, and have studied about 800 children each year. At birth this cohort consisted of white and black children in equal proportions; the full range of social levels is represented, and the entire group has been studied prospectively by individual case studies. At the moment we are in the thirteenth period of contact with probands. Attrition has been a constant problem, especially with the poorer families. However, we have managed to devise strategies to resist attrition which have been comparatively successful. The characteristics of the probands are given in Table 1.

PROBLEM

This paper addresses itself to the identification of significant influences on the cognitive readiness of the St. Louis 1966 cohort at age 60 and 66 months. The potential influences given in Table 2 together with a listing of the criterion series are in three groups, child data, maternal data, and ecological data.

METHOD

All measures were obtained by prospective study, which began with Apgar scores (1958) calculated in the delivery room in the first few minutes of life. Subsequent measures were gathered by individual case study in the home, with children and examiners matched by race. Data have been analyzed for this report using multiple linear regression programs developed and refined by Bottenberg and Ward (1963), Kelly, Beggs, and McNeil (1969), and in 1972 by Koplyay, Gott, and Elton (Koplyay, 1972).

The results of the inquiry was presented at two stages. In Table 3 we see the significant relationships across time between the predictors and the cognitive criteria.[1] The first predictor group, child data, exerted an influence through the first four years, largely through sex. Apgar scores have not proven particularly useful, although some forms of biological risk were slightly influential in the earliest years (Jordan, 1971). The maternal data group exerted a longer span of influence, ranging all the way through the preschool years. Anxiety in mothers was an early if temporary influence on test scores. Maternal age at delivery rose and fell in influence across the years. Maternal authoritarianism in family ideology measured at birth began to emerge as a negative influence at age four. In contrast, Table 3 shows that ecological data were a steady and comparatively strong influence. Inspection shows that racial differences were detectable across the preschool span. However, the greater influence is clearly social class status. This predictor is the McGuire and White three factor index based on occupation, education, and source of income.

Final comments at this stage of the results are as follows. First, Table 3 shows forty three statistically significant effects out of a possible one hundred and thirty five. Two thirds of the relationships are insignificant, and the remaining one third are not overwhelming in their magnitude. Second, the R^2 values at the bottom of each column in Table 3 are low, despite a relatively long predictor series. Even the statistically significant influences account for no more than about a quarter of the full model variance. As a third comment we may concentrate on the

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[1]Related analyses have been performed on biological growth. See Jordan and Spaner, 1970, 1972, and 1973 (in press).

criteria studied at age five years. The essential element is that the criteria represent two domains of school aptitude. The first is the verbal integration process exemplified by the WPPSI Vocabulary and the ITPA Auditory Association (r = .28, p = .0001). The second is the mental process represented by ITPA Digit Span.

We may now move to the second part of the analysis. What has been presented so far is a set of effects, but the more elaborate and pressing question is the nature of the more significant effects and their interactions. The second part of this analysis consisted of reviewing the materials presented so far identifying the more salient influences at the end of the preschool period. Two linguistic-integrative skills, WPPSI Vocabulary, and ITPA Auditory Association, represent school readiness in the sense of mental abilities consonant with the linguistic process of elementary classrooms, and they are highly correlated with other readiness measures (Aud. Assoc./Preschool Inventory, r = .68, p = <.01; Vocabulary/Preschool Inventory, r = .54, p<.01). The third 60 month criterion is the number of successfully passed digit span items from the ITPA. This is generally held to be a measure of intellectual ability less subject to cultural bias (The data of this investigation, however, yielded a correlation of .47 with social class). These three measures were re-analyzed using four predictors which seemed to be significant influences, sex, social class score, authoritarian family ideology, and delivery age. Sex has been construed as a biosocial element in analyses to date, rather than a social construct only. Social class is a general environmental influence; authoritarianism and age refer to maternal attributes at delivery of the probands.

The second part of the analysis consisted of studying the three cri-

teria in an independent sample of children tested six months later at age 66 months. The three criterion measures were subjected to hierarchical interaction analyses using Koplyay's (1972) AID-4 regression program. AID-4 analysis indicates by a process of dichotomization the order of influence of variables and their interactions. In some respects it is a discriminant analysis, in other respects it is a maximum regression model building technique. It's most effective application to date is probably Olson's (1970) analysis of indicators of quality in 18,000 classrooms. As applied in this investigation AID-4 has identified salient interactions of predictors and their priorities.

66 Month WPPSI Vocabulary was analyzed first. A branching tree was generated for high and low groups. The major influence on high scores was an interaction of authoritarianism scores and social class. For low WPPSI Vocabulary scores authoritarianism interacted with maternal age at delivery. In the case of ITPA Auditory Association the same two elements, authoritarianism and social class, were dominant influences. However, the major influence was SES with authoritarianism at the second level of effect for high scores; for low scores the second level of effect detected was interaction with social class once more. At the third level of effect authoritarianism influences were shown, while no such parallel effect occurred for high scores. Digit Span, described by Jensen (1970) as a Level I (associative learning) mental operation was the third criterion submitted to the AID-4 analysis. The upper scores are influenced primarily by social class and delivery age. For the lower scores the influences were social class followed by further elaborations of social class. For all three criteria the sex of the children at 66 months was not very influential.

DISCUSSION AND IMPLICATIONS

The data of the first part of investigation suggest that readiness understood as cognitive maturity has two apparently contradictory aspects. First, it is demonstrably influenced by identifiable elements in the preschool years. Second the degree of influence exerted by identified influences, and expressed as the proportion of criterion variance is less than that exerted by unidentified influences. To some extent we can say that all three predictor domains, child, maternal, and environmental data, have a role in shaping readiness. When we come to order those influences, that is interpret the AID-4 results, in part two of this report, we see that the greatest of the influences is social class followed by authoritarian/liberal maternal ideology, age of mother at delivery, and, finally, the sex of the child.

A summary of high readiness children is that they come from middle class homes and have permissive mothers. Low readiness children generally are the products of lower class homes, with further elaborations traceable to authoritarianism and to age of mothers at the time of delivery (Jordan, 1970).

From the findings of this study we may make some observations for improving school readiness.

1. Readiness is a determinate state traceable largely to the social characteristics of the family.
2. As social circumstances in society rise so responsiveness to school will rise.
3. Educators cannot change the economy and the social system. They can, however, encourage a liberal, non-repressive attitude towards children in mothers and in girls who will become mothers.

At the level of systematizing preschool strategies we surmise that:

1. Early identification of children prone to school difficulty is possible.
2. Intervention treatments might be structured from the data of early development before learning failure emerges.
3. A data-based combination of identification and remediation could be systematized.
4. Explicit patterns of proneness-to-failure, educational equivalents of pediatric's at risk status, can be elicited.
5. Discrete patterns of at risk status probably suggest programming differentiated by treatment and by age for intervention.
6. Parallel to these child-centered interventions programs of maternal education are indicated as methods of prevention.
7. Readiness for schooling emerges as a population trait much like health. It has an epidemiology and reflects the interplay of vectors of influence at the level of the community and the home.

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TABLE 1

CHARACTERISTICS OF THE STUDY GROUP

VARIABLE	RANGE	MEAN	STANDARD DEVIATION
Two Year Group, N = 364			
Birth Weight (lbs)	2.56-12.00	7.22	1.22
Apgar score	1-10	8.56	1.52
One Year Weight (lbs.)	17.00-27.12	21.27	2.64
One Year Development	7-19	14.80	2.11
Delivery Age	13-42	26.60	6.34
Maternal Anxiety	0-17	5.15	4.27
Social Class	16-84	49.89	15.84
AFI	6-46	27.51	9.28
Married Mothers	93%		
Sex	53% Male		
Race	77% White		
Two Year PAR Intellectual	9-29	18.15	3.71
Two Year Mechan Language	2-36	19.83	5.10
Three Year Group, N = 176			
Birth Weight (lbs.)	2.30-12.00	7.16	1.21
Apgar Score	2-10	8.72	1.3[illegible]
One Year Weight (lbs.)	15.90-30.10	22.14	2.56
One Year Development	10-19	14.77	2.07
Delivery Age	15-43	26.14	6.44
Maternal Anxiety	0-17	5.42	4.39
Social Class	16-81	50.17	16.83
AFI	7-46	28.62	8.84
Married Mothers	92%		
Sex	55% Male		
Race	/6% White		
Peabody Picture Vocabulary Test	5-54	27.04	11.09
Four Year Group, N = 181			
Birth Weight (lbs.)	2.50-12.00	7.21	1.19
Apgar Score	4-10	8.83	1.14
One Year Weight (lbs.)	15.90-30.10	22.20	2.59
One Year Development	10-19	14.79	2.14
Delivery Age	15-43	25.85	6.36
Maternal Anxiety	0-17	5.37	4.44
Social Class	16-81	49.96	17.04
AFI	7-46	28.88	8.84
Married Mothers	91%		
Sex	54% Male		
Race	75% White		
Boehm Test of Basic Concepts	0-24	14.59	5.04
Preschool Inventory	0-58	34.66	12.42
Five Year Group, N = 180			
Birth Weight (lbs.)	2.50-12.00	7.22	1.18
Apgar Score	2-10	8.79	1.25
One Year Weight (lbs.)	15.90-30.00	22.19	2.51
One Year Development	10-19	14.82	2.13
Delivery Age	15-43	25.74	6.23
Maternal Anxiety	0-17	5.42	4.48
Social Class	16-81	49.49	16.88
AFI	7-46	28.75	8.79
Married Mothers	92%		
Sex	54% Male		
Race	75% White		
WPPSI Vocabulary	2-36	14.52	5.21
ITPA Auditory Association	4-25	10.58	4.02
ITPA Digit Span Items	4-30	14.82	2.13

TABLE 2

PREDICTOR AND CRITERION SERIES

PREDICTORS	CRITERION
Child Data	Two Years
Birth weight	Preschool Attainment Record, Intellectual score (Doll, 1966)
Apgar score	Verbal Language Development Scale (Mecham, 1959)
Sex	
Risk status	Three Years
12 month development	Peabody Picture Vocabulary Scale (Dunn, 1965)
12 month weight	
Maternal Data	Four Years
Anxiety score	Boehm Test of Basic Concepts (1967)
Delivery age	Preschool Inventory (Caldwell, 1970)
AFI_{65}	Five Years
Marital status	Illinois Test of Psycholinguistic Abilities (1969) Auditory Association and Auditory Sequential Memory Subtests
Ecological Data	Wechsler Preschool and Primary Scale of Intelligence (1968) Vocabulary subtest
Race	
SES	

TABLE 3

PROPORTION OF CRITERION VARIANCE ACCOUNTED FOR (R^2) BY STATISTICALLY SIGNIFICANT PREDICTORS

Predictors	CRITERIA							
	One Year	Two Years		Three Years	Four Years		Five Years	
	Jordan & Spaner (1970) Criteria	PAR Intellectual Score	Verbal Language Development Scale	Peabody Picture Vocabulary Test	Boehm Test of Basic Concepts	Preschool Inventory	WPPSI Vocabulary	ITPA Aud. Assoc.	ITPA Digit Span
Child Data	.13	.06	.14		.06	.03			
Sex		.01	.03		.03				
Birth Weight									
Apgar									
12 Mo. Weight					.03				
12 Mo. Devpm.		.04	.10						
Risk Factor									
Maternal Data		.04		.05	.04	.05			.05
Anxiety		.01	.01						
Delivery Age		.02						.03	.01
AFI65					.03	.04	.02	.02	.04
Married							.01		
Ecological Data		.02	.03		.06	.06	.04	.06	.07
Social Class		.02	.02		.02	.04	.04		.06
Ethnic Group		.01			.02			.06	
(Full Model)	.16	.12	.20	.20	.30	.37	.17	.14	.30

FIGURE 1

AID-4 ANALYSIS OF WPPSI Vocabulary at AGE 66 MONTHS

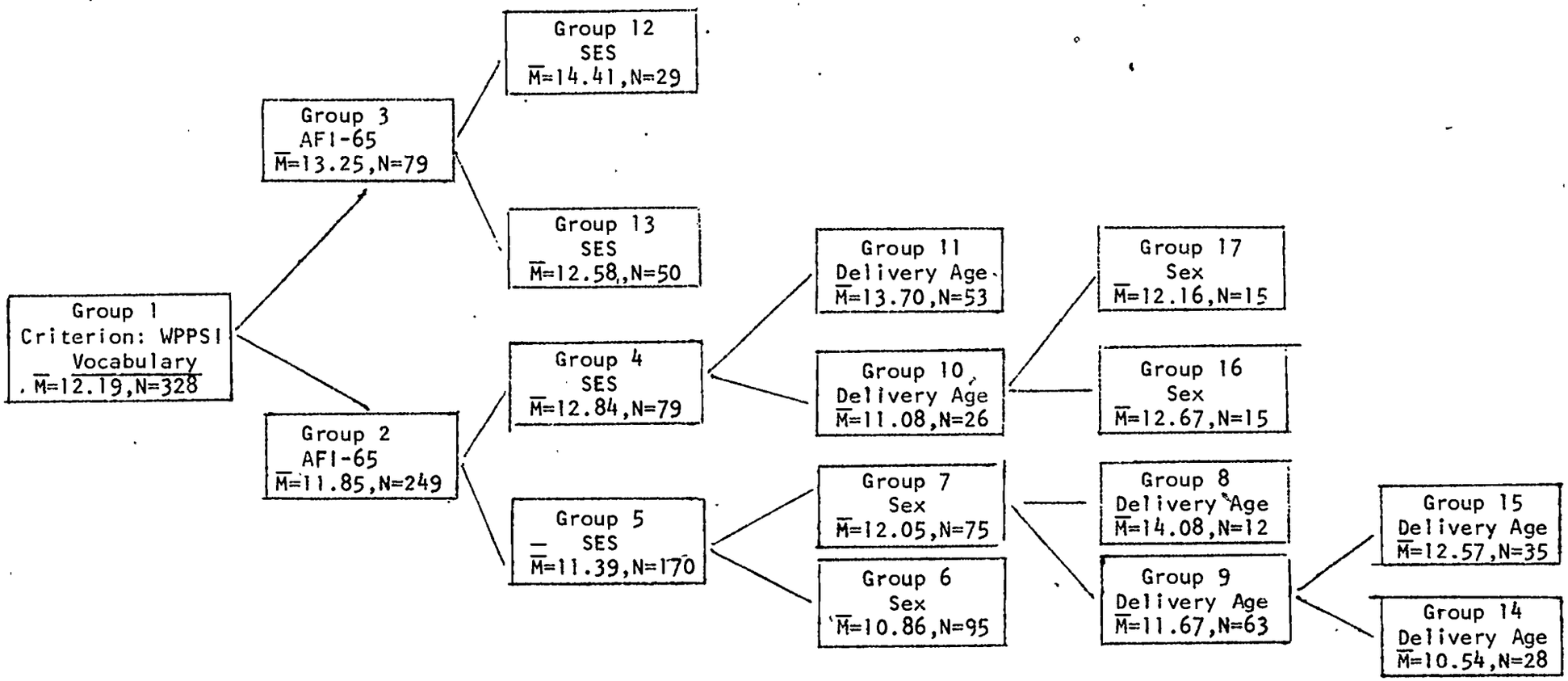

FIGURE 2

AID-4 ANALYSIS OF ITPA Auditory Association AT AGE 66 MONTHS

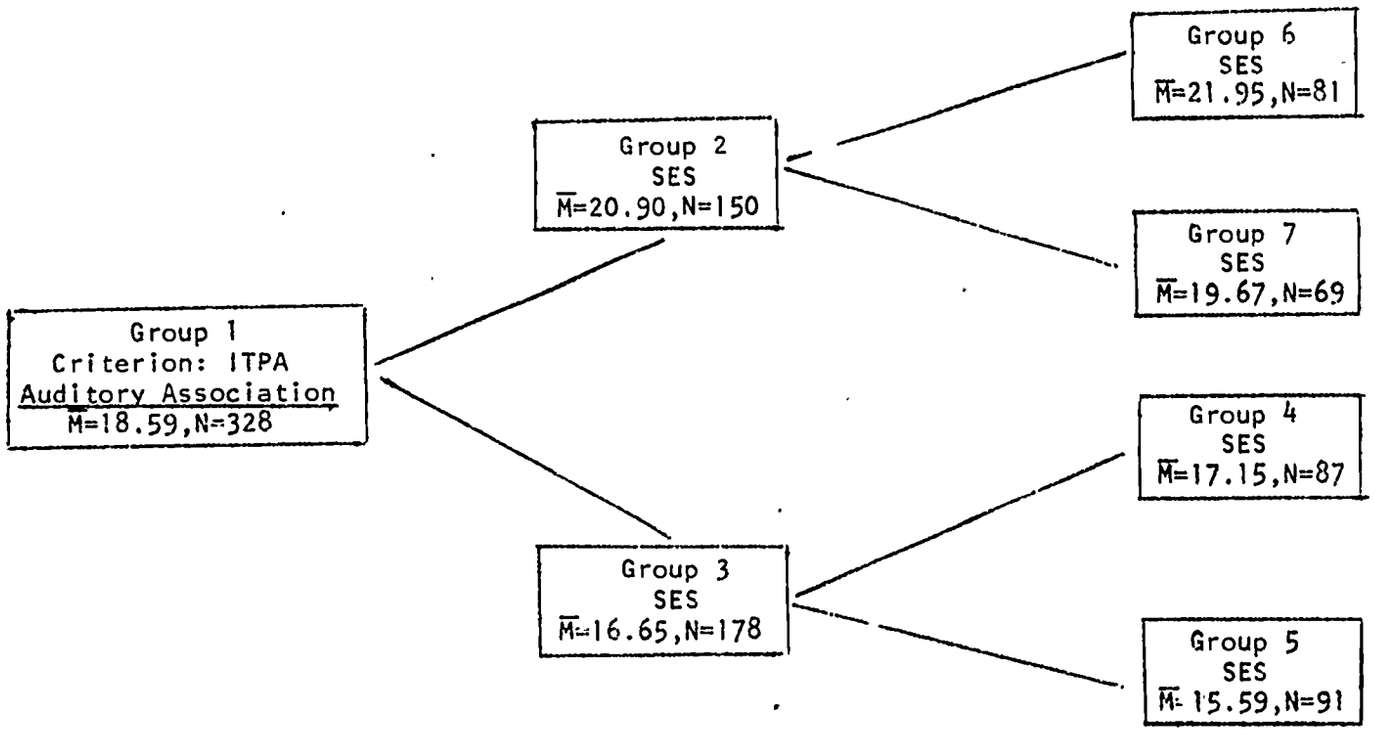

FIGURE 3

AID-4 ANALYSIS OF ITPA DIGIT SPAN AT AGE 66 MONTHS